

Controlling Tools in IT-Innovation Processes

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Numerous studies have shown that innovation is the main driving force behind business value creation or the production of value-added. But what exactly is innovation, and why has it become so critical to business success and what connections it has to information technology? The article approaches the question by introducing the system of innovation. After appointing the place of the assessment of IT-novelties with a new conception, explores the very interesting area in the intersection of IT, innovation and controlling with the aim of giving a map in the hand of decision makers.

Keywords: information technology (IT), innovation, controlling, Stage-Gate process

1 Introduction

As a consequence of continuous research and development activities in the field of information technology (IT) new products, procedures and applications are being constantly introduced to the market. Because the estimation and appreciation of their business usability is a big challenge, the surmountation has a number one priority among market leader companies. It is very important that a value-optimizing company is able to predict the business results of information technology novelties.

As a result of the serial emergment of IT-innovations (e. g. dynamic programming, semantic web, internet business models etc.) the rapid and accurate exploration of them became essential for the potential users. It makes decidable if the given innovation is worth for utilization, introduction and application. The business discipline, method and approach which can help us to solve these problems is the **controlling** whose specific application opportunities are in the focus of our investigation.

2 The system of innovation

2.1 The increasing economic importance of innovation

Today's renowned experts agree with Schumpeter ('the father of innovation') in that the economic role of knowledge and the proactivity it provides have gained in importance lately, as a result of which the scientific and technical development and the innovation behind them have become the main sources of dynamism and competitiveness both at the level of enterprises (micro level) and of the national economy (macro level), while capital and labour – the traditional drivers of extensive growth – contribute less and less to development and are gradually replaced by innovation.

2.2 Basic concepts of innovation

An internationally accepted definition of innovation is included in the so-called **Frascati Manual** published and regularly updated by the OECD. According to the manual, innovation is the transformation of an idea either into a new or updated product launched on the market or into a new or improved process utilized in the industry or commerce, or a revolutionary approach to a social service. [OECD, 1993]

The generally accepted **concept of innovation** has been continuously changing and expanding in recent decades. The latest concept has not only included product and process innovation in the scope of assessment, but also organizational and, at the same time, IT-innovation. This is illustrated by the following figure:

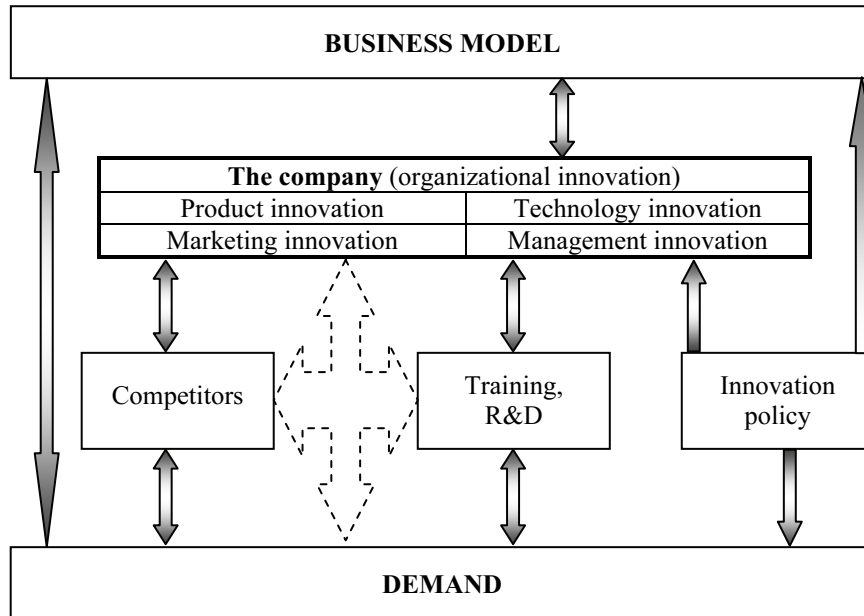


Figure 1

The key elements of the innovation system (own design, based on Pakucs-Papanek, 2006)

IT contains elements from all four areas of innovation in a company (as displayed in the figure), therefore **IT-innovation** can be considered as a **comprehensive process** affecting the entire corporation, the successful implementation and application of which can fundamentally change the operation, profitability and competitiveness of the company.

2.3 IT-innovations

So **innovations are closely linked to IT**, be it operating or strategic issues: if a company plans to introduce some sort of a novelty, it cannot bypass the IT-related elements of innovation since even the smallest innovation has a direct or indirect bearing on the existing information system. This is less true for product innovations, for example, but the more we move from the operating level towards the strategic areas, the stronger the effect of the innovation process on company IT becomes, and vice versa.

2.4 The necessity of assessing IT-innovations

The **most important consequence** of the endless stream of **innovations** was that the so-called sellers' market dominating until the 1970s was gradually transformed into a buyers' market. This was primarily inspired by the capacity growth resulting from technological development – these capacities helped manufacturers and service providers offer a supply that exceeded demand. The following table summarizes the most important characteristics of transition:

Sellers' market	Buyers' market
Industrial economy (car manufacturing in the last millennium)	Knowledge economy (‘media manufacturing’ in the new millennium)
<u>Customer focus:</u> availability price persuasion	<u>Customer focus:</u> selection customer value conviction
<u>Management focus:</u> internal efficiency costs production capacity maximizing industry structure management accounting	<u>Management focus:</u> external effectiveness customer engagement innovation optimizing business model controlling

Table 1

The main characteristics of sellers’ and buyers’ market (own compilation)

For us, the three categories of the management focus (**innovation**, **business model** and **controlling**) are the most relevant as IT-innovations are located in the intersection of innovation and the business model. The part of this latter area that intersects with controlling leads us to the assessment of IT-innovations and issues related to the management of this function, and draws our attention to the necessity of evaluating IT-innovations.

For this reason, companies must remember to regularly monitor emerging innovations, determine their relevance, assess their potential usefulness, quantify the risks associated with their implementation; that is, realize the necessity of **innovation management**.

A study by McKinsey in 2004 pointed out that IT-innovations provide more significant advantages to leading companies than normal, i.e. the principle of 'winner takes all' is even more prevalent. The second and third largest companies in the market are usually unable to obtain an appropriate market share for them to transform their success in innovation into success in business. For leading companies, **innovation controlling** provides the biggest help.

It becomes clear from the above why it is necessary to assess IT-innovations. However, we must thoroughly consider how all of this can be accomplished. For this, we need to be clear about the nature of innovation processes. A tool for helping understand this is the so-called **Stage-Gate** process which is presented in the next chapter.

3 The Stage-Gate process and the place of assessment

In developing the so-called **Stage-Gate innovation process**, a management methodology is created whose starting point is the analysis of the factors responsible for the success of product and service development. Its success and rapidly spreading use are both down to its revolutionary approach.

The Stage-Gate method serves as a **road map** for the individuals involved, thereby facilitating the conceptual and operating management of innovation projects, and leads the way from the idea to the implementation. Through its unique structure it breaks down the complex structure of innovation processes into transparent and manageable units. Within the process, transitions between units are always preceded by decisions made by company executives, for which the reports of cross-functional groups are used. At the same time, this method broadens the information base of decisions, which helps mitigate the future risks of the innovation process significantly.

Product and service innovation always begins with some sort of an idea, and ends with some kind of a product, be it tangible or intangible. Let's consider the steps between these two endpoints as a dynamic process that is broken down by the Stage-Gate method into a series of activities (stages) where the dividing points are the various management decisions (gates).

The characteristics of the **stages** are as follows:

- The majority of the research, development and evaluation efforts takes place here: through the work of the project team the process progresses from one end of a stage to the other, i.e. to the next decision point.
- Cross-functional tasks (R&D, marketing, controlling) are performed at each stage, which means there are no separate so-called functional stages. Thus the process is characterized by parallelism, which makes it fast and efficient.
- Risk management: designing future scenarios based on information available. The technical, market-related, financial and operating activities

are analysed thoroughly, and attempts are made to use this analysis in drawing conclusions and formulating a vision. This is another area where parallelism is prominent.

- Consecutive stages are incremental, i.e. the cumulated investment amounts increase gradually. The rules of the process require that all this be accompanied by a reduction in risks and an increase in expected value.

The key features of **the gates** are:

- This is where decisions concerning continuation or discontinuation are made. The individual processes are prioritised here as well.
- 'Mediocre' projects are halted and the resources taken up by them are released; improvements classified as promising are preferred.
- The key decision criteria include the quality of implementation, business logic and the quality of the action plan. This means that only those projects that are economically profitable and those that promise quality results are allowed to continue.

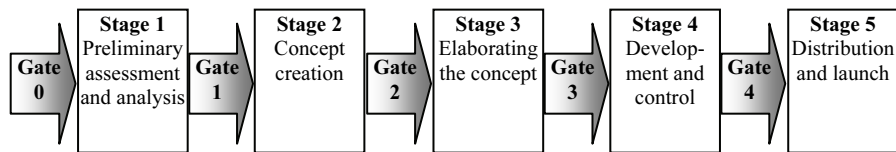


Figure 2

The Stage-Gate process

Designed by *Robert Cooper*, this approach enables the flexible aggregation of the various pieces of information, helps risk-management and expands the process to involve end users who will eventually utilize and apply the outputs of innovation. As a result of all this, it also supports the **controlling concept** we consider relevant, as it very much fits the information structure of the roles of planning and control. In practice, this means that the Stage-Gate methodology – due to its structured nature – easily makes the innovation process tactile and understandable, and facilitates the execution of both the evaluation and controlling functions and management decision-making through interaction between the controller and the project manager. In other words, it creates a platform for the joint interest of the manager leading the innovation project and the person responsible for controlling.

Let's look at a specific case to see what happens at each of the stages and gates:

#	STAGE	GATE
0		Brainstorming, evaluation
1	<i>Preliminary assessment and analysis:</i> preparation of special purpose studies to identify the focal points of research analysis of the technology and market portfolios; generating ideas.	Selection of the research project based on predefined requirements and evaluation criteria.
2	<i>Concept creation:</i> the early phase of research; creating and defining a technological concept.	Acceptance of the research results.
3	<i>Refining the concept:</i> developing and testing the prototype technology/procedure; modeling databases and operating processes; performing various simulations; testing the scalability of the system and end-user acceptability; preparing a feasibility study for the concept.	Providing valid proof for technical feasibility.
4	<i>Development and control:</i> execution of a pilot project; verifying and documenting the new capability or performance, testing the new market opportunities.	Providing valid proof for commercial feasibility.
5	<i>Distribution, sales:</i> all activities that support the diffusion of innovation as quickly as possible (both within and outside the company).	

Table 2
The innovation process in the Stage-Gate model

Summarized, it can be stated that **the Stage-Gate model** is an efficient innovation management tool which integrates the structured decision making into the investment process in connection with the research portfolio. In addition it handles the different innovation projects in a surprisingly flexible way, so it can tailor them to the requirements on return on investment. Some of the overall targets are as follows:

- Setting out directives on consistent innovation portfolio management.
- Defining the optimal level of R&D investments.
- Supporting project controlling and the maximization of the expected result.
- Unifying the decision making methodology.

The application of Stage-Gate procedure has many advantages of which the most important is its capability to provide **consistent directives and definitions** to the evaluation of every stage of the research process and to the preparation of decision making, which actually makes the execution of controlling tasks easier and it contributes to the dissemination of the success of innovation.

In the model based interpretation of innovation process the **controlling function appears divided but linked to** the separate **gates**. Here become the data generated in different stages of the process to information in base of which the decisions about the proceeding are made.

In the second chapter from the growing business importance of innovations we got to the requirement of their evaluation and we identified the main points of innovation definitions, then we focused on IT-novelties. Finally we appointed the place of assessment of IT-innovations by describing the Stage-Gate process.

So far we had a long distance focus on our topic. In the following chapter we will scrutinize the controlling of IT-innovations through some important and interesting fields of it.

4 IT, innovation, controlling

Innovation based researches and developments always aim at starting up something brand new (product, process). An important aspect of this procedure is its **separation from other processes** within companies or research institutions. These characteristics count first of all from the controller point of view, as it becomes more tangible, analysable, influenceable.

The **possibility of measuring applicability in practice** are so as typical for innovation processes (selling to the market, application), being also the **last gate** of innovation projects. An innovation project can be considered successful when it is or directly launched to the market or indirectly used for further idea generation, for rationalization of business processes.

4.1 The controlling and the innovation projects

When deciding on executing an internal innovation, it is strongly recommended for the company to set up a **target hierarchy system** to which the resources of the company can be allocated. Those separated projects, which are having the elaboration of a **novelty** on the top of their target hierarchy system with own resources allocated to them, are called **innovation projects**.

This kind of distinction helps within the Stage-Gate approach the project related handling, managing, evaluating and considering of an innovation process, accordingly meaning the **extension of controlling function to innovation projects**.

Controllers function as the ‘business conscience’ of the company supporting the management in corporate governance. The managing and organizing tasks start with defining clear targets and planning the path leading to them. From this aspect it does not differ from other management functions. [Daum, 2007]

Similarly as before, the innovation controlling also starts with **appointing obvious business targets** the realization of which is to be supported by operative and strategic tools, containing specific processes for reaching the target and measurements for evaluating the results.

Therefore, controlling provides information for the top decision makers, being from this point of view the no. 1 supporting element of management decisions. Its realization in practice proceeds through a systematic information management process providing the link between planning and governance. Controlling in this sense, supports both **effectiveness** (by reaching the targets) and **efficiency** (by adequate use of resources).

When managing innovation projects, to some extent the controlling function differs. On one hand regarding innovation it is more crucial to define the range of information needed then to procure and to structure them. On the other hand the method of gathering, processing, analyzing information has to be defined considering the innovation-specific characteristic of the project. In such a system, the project controller is in a strong cooperation with the innovation project manager, with senior analyst, the manager in charge of innovation, working so, he/she realizes the innovation controlling function. This is the so called **four-party management model**. [Véry, 2007]

After introducing the main characteristics of innovation projects and innovation controlling, we switch to the issue which shows us what kind of help could the information technology controlling mean for innovations.

4.2 Controlling of IT-innovations

When dividing the business information technology in two parts – infrastructure and applications – the innovation can be realized in two manners: as innovative technology or as innovative application.

The different innovative applications can be successfully introduced only when an adequate infrastructure is available. However it is true from the other way around: an innovative technology (e.g. object-oriented databases) can lead later

to elaboration of innovative applications (e.g. enterprise resource planning systems).

In the so called '**technology oriented**' case, the **target of innovation is the development of the IT-infrastructure**. An infrastructure which provides a better performance, supports the business processes on a higher level than previously, therefore it enhances the attainment of a higher business profit. In consequence of a more modern infrastructure, a ground is generated for the development of the current application systems accordingly it can contribute to new applications.

In this case the development of infrastructure induces the development of applications, as if it pushed through the waves generated by innovation. Therefore it is called in the literature **push-procedure**.

The pair of technology oriented innovation process is the **process oriented innovation**. In this case development of IT aims at renewing of application systems which pulls over the modernization of IT-infrastructure. This is called **pull-procedure**.

The operation and the comparison of the two procedures with different orientations are illustrated below:

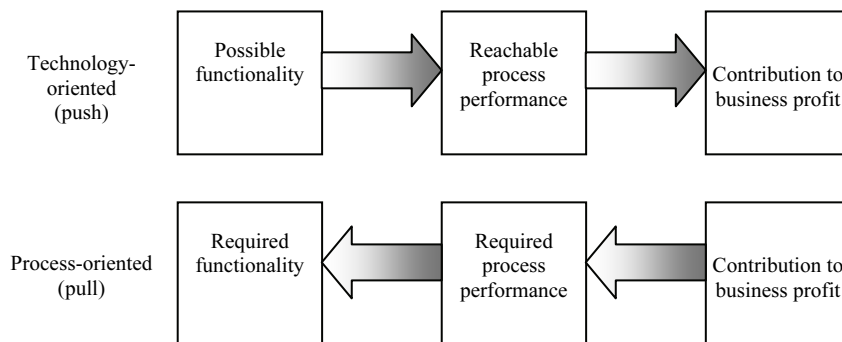


Figure 3

Drivers of IT-innovations (Source: Kempis – Ringbeck, 1998)

The **task of information technology controlling is to assure the cost effective and adequate business target oriented operation of information systems**. The IT-innovation has to meet the same requirement such as cost effectiveness and compliance. To broaden the view, we need to add quality-, functional- and time requirements. If we delegate quality and functionality as a pair for this kind of target orientation then we get an indicator for measuring the effectiveness of the information system. At the same time we can estimate the efficiency of information technology by finding the common denominator of cost

effectiveness and time focus. When reaching a critical level of development of information technology, it can contribute to the application of different innovations. Due to this coherency can the information technology enhance the introduction, constant development, functional broadening of different applications targeting at the same time the criteria (e.g. cost effectiveness) defined by the business plan, accordingly enhancing the business profit of the company.

IT-controlling and innovation are walking hand in hand: controlling supports innovation with the initiation of the adequate and appropriate circumstances. Because the key factor is the efficiency of the corporate IT, the number one aim will be its improvement. This can be achieved by the optimization or re-engineering of the most important business processes according to industry best practices (benchmarks).

5 Summary

The controlling of IT-innovations is becoming more and more hot topic of the profession because more and more decision-maker recognize the necessity of integrating and synthesizing approach of novelties. The today's competitive challenge and dilemma of business models and corporate ecosystem has to be answered by the efficient cooperation of informatics, innovation and controlling. Only this can guarantee the opportunity of elaborating discriminative competencies, the sustainable growth and the optimization of business value.

'Navigare necesse est' – sais the Latin. The aim of the study is to serve as a map for the 'four-party captaincy' on the seas of competitions helping them in preparing, analyzing and making business decisions.

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